

REMARKS

Favorable reconsideration is respectfully requested.

The claims are 1 to 11, 13 and 14, with claims 13 and 14 being withdrawn.

The above amendment to claim 1 incorporates the features of now canceled claim 12 as well as the features on page 11, line 31 to page 12, line 2 and Examples 1 and 2.

With regard to the objection to the specification, this has been corrected by the above amendment.

Claims 1, 2, 5, 6 and 8 to 12 have been rejected under 35 U.S.C. 102(e) as being anticipated by Minami et al. (U.S. Patent Application 2005/0129927).

Further, claims 4 and 7 have been rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Minami et al. (U.S. Patent Application 2005/0129927).

Lastly, claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Minami et al. (U.S. Patent Application 2005/0129927).

These rejections are respectfully traversed.

Firstly, the Japanese application corresponding to Minami et al. (U.S. 2005/0129927) was filed and published in Japan.

Date of filing	September 22, 2000
Application No.	2000-289528
Date of Publication	April 2, 2002
Publication No.	JP-A-2002-097013
Title of the Invention	Transparent thin film and method for production thereof

The above publication document and its partial translation are enclosed.

The above prior art was published before the filing date of the present application. Accordingly, it will now be explained why the present claims are patentable over such prior art, i.e. JP A-2002-097013 (JP '013 hereinafter).

JP '013 discloses in claim 7 a method for producing a transparent thin film comprising starting from a solution of a silicone alkoxide and a hydrolyzable titanium compound to form a gel film containing a composite metal oxide or hydroxide of the

titanium compound and the silicon alkoxide followed by bringing into contact with water or heated water to precipitate a titania microcrystal on the surface of the thin film.

For example, Example 1 of JP '013 discloses a method in which an ethanol solution of titanium (IV)tetra-n-butoxide was added to a solution of silicon ethoxide and hydrochloric acid, etc., to obtain a sol solution, and the sol solution was coated onto the surface of a substrate, heated for 1 hour at 90°C, and then treated with a heated water for 1 hour at 100°C, to obtain a transparent thin film.

JP '013 describes that its method can be conducted at a temperature as low as 100°C or lower and allows a transparent anatase thin film to be formed even on a poorly heat resistant support ([0035]).

The present invention relates to a ceramic thin film coating material having a slope constitution, which comprises a base material and a ceramic thin film comprising a composite phase composed of a first phase mainly formed of a silicon ceramic component and a second phase mainly formed of a ceramic component other than the silicon ceramic component of the first phase, in which the amount of fine crystal particles of the ceramic component that constitutes the second phase slopingly increases towards a surface layer, the base material being coated with the ceramic thin film,

wherein the ceramic thin film coating material is obtained by coating a base material surface with a modified organosilicon polymer modified with an organometallic compound or a mixture of an organosilicon polymer or said modified organosilicon polymer with an organometallic compound, carrying out a predetermined heat treatment, and calcining the resultant base material at a temperature in the range of from 1,200 to 1,800°C.

JP '013 discloses a transparent thin film which is obtained by the sol-gel process and is basically calcined at a low temperature. For this reason, a reaction phase is not formed between a substrate and a first phase and the adhesion strength between the substrate and the first phase is weak. As described on page 2, lines 15 to 25 of the present specification, when high-temperature treatment is carried out in the sol-gel process, the crystal form of titania converts from anatase into rutile. Therefore, it is necessary to carry out heat treatment at 500 to 700°C.

On the other hand, the present invention carries out high-temperature calcination at 1,200 to 1,800°C, so that a reaction phase is formed between the substrate and the first phase. Therefore, the present invention has an advantage in that the adhesion strength between the substrate and the first phase is high.

The calcination temperature in Comparative Example 1 of the present specification was 600°C. In this case, the adhesion between the coating layer was peeled off when touched with a finger.

In the sol-gel process, the calcination is carried out at a low temperature in spite of a decrease in the adhesion. The reason is because the temperature at which crystallization occurs in the sol-gel process is lower than that in the present invention. For example, when the second phase is titanium oxide and calcination is carried out at 700°C or higher, the crystal form of the titanium oxide converts from anatase into rutile, as explained above, and the photocatalyst performance decreases. In the sol-gel process, it is impossible to obtain fine crystals unless the calcination temperature is low. Generally, as the crystal size of titanium oxide decreases, the photocatalyst performance increases. When the calcination temperature is increased, a decrease in the photocatalyst performance is unavoidable.

On the other hand, crystals of the anatase form are maintained even at a high temperature of 1,200°C or higher in the present invention. Further, the crystal size is extremely fine.

In addition to the adhesion strength to the substrate, the presence or absence of a crack in a coating film is also an important problem as a coating material. In the sol-gel process, when the calcination temperature is increased, the adhesion strength increases. However, in this case, crystallization advances and a crack occurs in the coating film. This is a significant defect as a coating material. This is also obvious from Comparative Example 2 of the present specification in which calcination was carried out at 1,400°C and this a lot of cracks in the coating layer and peeling-off of the coating layer were found.

In contrast, there is provided a coating material which overcomes the problems of the adhesion strength and cracks according to the present invention.

For the foregoing reasons, it is apparent that the rejections over JP '013 or its U.S. counterpart are untenable and should be withdrawn.

Further, claims 1, 5, 6 and 9 have been rejected under 35 U.S.C. 102(b) as being anticipated by JP 7-312459A to Canon.

This rejection is also respectfully traversed.

The rejection states that Canon discloses a substrate with a thin film of AlN, Si₃N₄ and Al₂O₃ and another of Al₂O₃.

The rejection further states that Canon discloses that the composition density gradually increases in the direction of the film thickness (abstract).

In this regard, Canon merely discloses an optical semiconductor element wherein the composition density gradually increases in the direction of the film thickness. Canon does not at all teach or suggest the ceramic thin film coating material having the above-discussed features and advantages which are a function of the steps and components recited in above amended claim 1.

No further issues remaining, allowance of this application is respectfully requested.

If the Examiner has any comments or proposals for expediting prosecution, please contact undersigned at the telephone number below.

Respectfully submitted,

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